Middle East Technical University — Department of Computer Engineering

CENG 222

Statistical Methods for Computer Engineering

Spring 2019-2020

Homework 3

Due date: 17 May 2020, Sunday, 23:55

Questions

Q1. (*30 pts.*) A survey was conducted on 34 subjects in UK in which they were asked how much they agree with BREXIT (withdrawal of UK from EU). In the survey, they were expected to indicate their opinion with a number between 1 and 5, where 1 means strongly negative about BREXIT, and 5 means strongly agree.

The results of the survey has been divided into two groups: People with age 40 and above, and under 40. There were 19 people in the first group whose answers have a mean 3.375 with a standard deviation of 0.96, and there were 15 people in the second group whose answers have a mean 2.05 with a standard deviation of 1.12. Assume the population is normally distributed and each subject answered the question independently.

a) (*15 pts.*) Compute 95% confidence interval on the difference between the means.

b) (*10 pts.*) Compute 90% confidence interval on the difference between the means.

c) (*5 pts.*) Assuming 3 in the scale is being 'neutral' about BREXIT decision, can we say people with age 40 and above supports BREXIT with 95% confidence level?

Q2. (*35 pts.*) Suppose there is a company producing sports equipments. 20.00 kg olympic bars are being produced in one of their production lines. The line staff checks the quality of the products by drawing samples at each hour and do some statistical calculations on them, if the statistical significance is above 1%, they stop production and check the line.

They have drawn 11 samples with a mean weight 20.07 kg and with a standard deviation of 0.07 kg. Should they stop producing and check the production line?

a) (*5 pts.*) State the null hypothesis H_0.

b) (*5 pts.*) State the alternate hypothesis H_A.

c) (*25 pts.*) Draw a t-test diagram and indicate the rejection regions. Do the necessary calculations and state the conclusion.

Q3. (*35 pts.*) Suppose a pharmaceutical company claims they developed a new painkiller drug superior to the ones already in market. According to their experiments on 68 subjects the new painkiller reduces headache in 2.8 minutes with a standard deviation of 1.7 minute. Please note that the painkillers existing in the market reduce headache in 3 minutes on average with a standard deviation of 1.4 minute. With 5% level of significance, can we state the new painkiller really produce better results?

a) (*5 pts.*) State the null hypothesis H_0.

b) (*5 pts.*) State the alternate hypothesis H_A.

c) (*25 pts.*) Draw a z-test diagram and indicate the rejection regions. Do the necessary calculations and state the conclusion.

Specifications

- You are expected to write your answers in LaTeX format. You can use the given template.
- Please do not skip the calculation steps. Show every step of your work.
- You have a total of 3 late days for this homework. For each day you have submitted late, you will lose 20 points. The homeworks you submit after 3 late days will not be graded.
- Cheating is forbidden. The violators will be punished according to the department regulations.
- Follow the course page on COW for any updates and clarifications. Please ask your questions on COW instead of e-mailing if they do not contain some part of the solution. If they contain some part of the solution, you can send an email to "cseylan@ceng.metu.edu.tr".

Submission

Submissions will be done via ODTUCLASS. If you do not have access to ODTUCLASS for some reason, please send an email to assistants about that. You are expected to submit a zip file named "hw3.zip" that contains both **your latex source** and also **the compiled version of it in pdf format**.